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(54) **Head drum assembly for tape recorder**

Kopftrommelanordnung für Bandrecorder

Assemblage de tambour de tête pour enregistreur à bande

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(56) References cited:
US-A- 4 829 401 **US-A- 5 392 180**

- **PATENT ABSTRACTS OF JAPAN vol. 1998, no. 09, 31 July 1998 (1998-07-31) -& JP 10 112002 A (SONY CORP), 28 April 1998 (1998-04-28)**
- **PATENT ABSTRACTS OF JAPAN vol. 014, no. 148 (P-1024), 20 March 1990 (1990-03-20) & JP 02 009002 A (FUJI PHOTO FILM CO LTD), 12 January 1990 (1990-01-12)**
- **PATENT ABSTRACTS OF JAPAN vol. 009, no. 193 (E-334), 9 August 1985 (1985-08-09) -& JP 60 060704 A (HITACHI SEISAKUSHO KK), 8 April 1985 (1985-04-08)**
- **PATENT ABSTRACTS OF JAPAN vol. 015, no. 051 (P-1163), 6 February 1991 (1991-02-06) -& JP 02 282904 A (MATSUSHITA ELECTRIC IND CO LTD), 20 November 1990 (1990-11-20)**
- **PATENT ABSTRACTS OF JAPAN vol. 016, no. 065 (P-1313), 18 February 1992 (1992-02-18) & JP 03 259402 A (HITACHI LTD), 19 November 1991 (1991-11-19)**
- **PATENT ABSTRACTS OF JAPAN vol. 010, no. 364 (P-524), 5 December 1986 (1986-12-05) -& JP 61 160801 A (HITACHI LTD;OTHERS: 01), 21 July 1986 (1986-07-21)**
- **PATENT ABSTRACTS OF JAPAN vol. 015, no. 051 (P-1163), 6 February 1991 (1991-02-06) -& JP 02 282903 A (MATSUSHITA ELECTRIC IND CO LTD), 20 November 1990 (1990-11-20)**
- **PATENT ABSTRACTS OF JAPAN vol. 010, no. 038 (P-428), 14 February 1986 (1986-02-14) & JP 60 185204 A (HITACHI SEISAKUSHO KK), 20 September 1985 (1985-09-20)**
- **PATENT ABSTRACTS OF JAPAN vol. 011, no. 195 (E-518), 23 June 1987 (1987-06-23) -& JP 62 021203 A (HITACHI LTD), 29 January 1987 (1987-01-29)**

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Description

[0001] The present invention relates to a rotary head drum assembly for a tape recorder, and more particularly, to a connection structure of a flexible printed circuit for electrically connecting a head drum assembly and a main printed circuit board (PCB), for transmitting to the main PCB an information signal read while a magnetic head scans a magnetic tape.

[0002] A head drum assembly which rotates at a high speed for recording/reproducing information on/from a magnetic tape by a magnetic head is provided in a deck of a camera-incorporated tape recorder, e.g., a camcorder, or a VCR.

[0003] Referring to Figures 1 and 2, a conventional head drum assembly 100 installed in a tape recorder includes a rotary drum 120 rotatably supported by a rotation shaft 110 and in which a magnetic head "h" is installed, and a stationary drum 130 obliquely fixed to a drum base 11 installed in a main base 10. The rotary drum 120 is rotatably coupled to the stationary drum 130 such that the rotation shaft 110 is supported to a bearing 111.

[0004] A stator core 140 around which a coil 141 is wound and a ring-shaped motor rotor 150 having a magnet 151 facing the stator core 140 are installed in the lower portion of the stationary drum 130. Here, reference numerals 121 and 131 of Figure 2 represent a rotating rotary transformer and a fixed rotary transformer, installed in the rotary drum 120 and the stationary drum 130, respectively.

[0005] The rotating rotary transformer 121 and the fixed rotary transformer 131 are structured by a configuration of a plurality of concentric circles, and a coil (not shown) is wound in a concave groove (not shown) between the respective concentric circles. The coil wound around the rotating rotary transformer 121 is connected to the magnetic head "h", and the coil wound around the fixed rotary transformer 131 is connected to a flexible printed circuit 132 drawn out via a through hole 130a formed at a side wall of the stationary drum 130. An end of the flexible printed circuit 132 is connected to a connector 133, and the connector is coupled to a connector holder 12 provided in the drum base 11 to be electrically connected to a connector 21 installed in the main PCB 20. Thus, the information signal read by a scanning operation of the magnetic head "h" is transmitted to the main PCB 20 through the flexible printed circuit 132.

[0006] According to the conventional head drum assembly having the above-described configuration, in order to transmit the information signal read by the scanning of the magnetic head "h" to the main PCB 20, the flexible printed circuit 132 connected to the fixed rotary transformer 131 drawn out to the through hole 130a formed at the side wall of the stationary drum 130 must be connected to the main PCB 20. Thus, the length of the flexible printed circuit 132 is excessively increased, which may cause noise.

[0007] Also, since the drum base 11 having the connector holder 12 for supporting the connector 133 must be necessarily installed in the main base to stably connect the flexible printed circuit 132 to the connector 133 , the manufacturing cost increases.

[0008] JP-A-10112002 discloses a head drum assembly having two or more through holes and a connector pin located in each through hole to establish contact between a fixed rotary transformer and the equipment chassis. This document forms the pre-characterising portion of claim 1 appended hereto.

[0009] With a view to solve or reduce the above problems, it is an aim of preferred embodiments of the present invention to provide an improved rotary head drum assembly for a tape recorder, by which the length of a circuit for connecting a rotary transformer of a stationary drum and a main printed circuit board (PCB) is greatly reduced, and the connecting structure of the rotary transformer and the main PCB is simplified.

[0010] According to an aspect of the present invention, there is provided A head drum assembly for a tape recorder comprising: a stationary drum fixed on a main base of a deck and having a through hole formed on the bottom thereof; a rotary drum having a magnetic head and rotatably installed on the stationary drum by a rotation shaft; and rotary transformers installed in the rotary drum and the stationary drum, for transmitting an information signal read by the magnetic head to a main printed circuit board; characterised by: a flexible printed circuit electrically connected to the rotary transformers on a first side of the though hole; and a first connector coupled to an end of the flexible printed circuit for electrically connecting the flexible printed circuit to the main PCB; wherein the flexible printed circuit is drawn out directly downward via the through hole so that the first connector is electrically connected to a second connector installed in the main PCB which is located on a second side of the through hole.

[0011] Here, the first connector may be fittingly coupled to the through hole.

[0012] Preferably, the first connector circuit and having a first part coupled mechanically with the stationary drum via said through hole and a second part for the electrical connection of the flexible printed circuit to the main PCB.

[0013] Preferably a second connector is provided having a first end, electrically and mechanically coupled with the main PCB and having a second end for mechanically and electrically linking with the second part of the first connector.

[0014] Preferably, the first connector is a tight mechanical fit within the through hole.

[0015] A head drum assembly according to any of the preceding aspects further comprising any one or more features from the accompanying description, claims, abstract or drawings, in any combination.

[0016] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in

which:

Figure 1 is a schematic exploded perspective view of a conventional head drum assembly for a tape recorder;

Figure 2 is a schematic cross sectional view of the conventional head drum assembly shown in Figure 1;

Figure 3 is a schematic perspective view of a head drum assembly for a tape recorder according to an embodiment of the present invention; and

Figure 4 is a schematic cross sectional view of the head drum assembly shown in Figure 3.

[0017] Hereinbelow, a preferred embodiment of the present invention will be described in detail with reference to Figures 3 and 4. A rotary head drum assembly 200 according to the preferred embodiment of the present invention includes a rotary drum 220 to which a rotation shaft 210 is coupled and in which a magnetic head "h" is installed, a stationary drum 230 fixed to a main base 10' of a deck at the lower portion of the rotary drum 220, and a ring-shaped motor rotor 250 installed at the lower portion of the stationary drum 230. The rotary drum 220 is rotatably installed on the stationary drum 230 while the rotation shaft 210 is coupled to a bearing 211. Also, the motor rotor 250 includes a stator core 240 around which a coil 241 is wound, and a magnet 251 installed on the inner wall of the stator core 240 so as to face the same.

[0018] Here, reference numeral 232 represents a flexible printed circuit for transmitting an information signal read by the magnetic head "h" to a main printed circuit board (PCB) 20'. Reference numerals 221 and 231 represent a rotating rotary transformer and a fixed rotary transformer, installed in the rotary drum 220 and the stationary drum 230, respectively.

[0019] A plurality of concentric circles are formed on facing surfaces of the rotating rotary transformer 221 and the fixed rotary transformer 231, and a coil (not shown) is wound in a concave groove (not shown) between the respective concentric circles. The coil wound around the rotating rotary transformer 221 is connected to the magnetic head "h", and the coil wound around the fixed rotary transformer 231 is connected to the flexible printed circuit 232.

[0020] It is a characteristic feature of embodiments of the present invention that the connection structure of the flexible printed circuit 232 and the main PCB 20' is improved. The flexible printed circuit 232, as shown in Figure 4, is drawn out directly downward via a through hole 230a formed on the bottom of the stationary drum 230, so that an end of the flexible printed circuit 232 is connected to a first connector 233. Here, the first connector 233 is fitted into the through hole 230a.

[0021] The first connector 233 is electrically connected to a second connector 21' installed in the main PCB 20', and thus transmits the information signal read by a scanning operation of the magnetic head "h" to the main PCB 20'.

[0022] According to the head drum assembly of the present invention, since the first connector 233 is strongly fitted into the through hole 230a, the head drum assembly 200 can be coupled to the main base 10' of the deck, by easily connecting the first connector 233 and the second connector 21'. Also, since the connector holder 12 (see Figure 1) separately provided for stably supporting the connector, as in the conventional art, is not necessary, the drum base 11 in which the connector holder is installed is not necessary.

[0023] Further, as shown in Figure 4, a protruding flange 11' is formed directly on the main base 10', thereby safely locating the head drum assembly.

[0024] As described above, with the rotary head drum assembly for a tape recorder according to embodiments of the present invention, the length of a flexible printed circuit can be greatly reduced, thereby suppressing inferiority due to a noise generated during recording/reproduction of information. Also, since a drum base for supporting a connector of the flexible printed circuit is not necessary, the manufacturing cost of the rotary head drum assembly can be reduced.

Claims

1. A head drum assembly for a tape recorder comprising:

   a stationary drum (230) fixed on a main base (10') of a deck and having a through hole (230a) formed on the bottom thereof;
   a rotary drum (220) having a magnetic head (h) and rotatably installed on the stationary drum (230) by a rotation shaft (210); and
   rotary transformers (221, 231) installed in the rotary drum (220) and the stationary drum (230), for transmitting an information signal read by the magnetic head (h) to a main printed circuit board (PCB)(20');
   characterised by:

   a flexible printed circuit (232) electrically connected to the rotary transformers (221,231) on a first side of the though hole (230a); and
   a first connector (233) coupled to an end of the flexible printed circuit (232) for electrically connecting the flexible printed circuit (232) to the main PCB (20');
   wherein the flexible printed circuit (232) is drawn out directly downward via the through hole (230a) so that the first connector (233)

is electrically connected to a second connector (21') installed in the main PCB (20') which is located on a second side of the through hole (230a).

2. The head drum assembly according to claim 1, wherein the first connector (233) is fittingly coupled to the through hole (230a).

3. A head drum assembly according to claim 1, wherein:

the first connector (233) has a first part coupled mechanically with the stationary drum (230) via said through hole (230a) and a second part for the electrical connection of the flexible printed circuit (232) to the main PCB (20').

4. A head drum according to Claim 3, wherein a second connector (21) is provided having a first end, electrically and mechanically coupled with the main PCB (20') and having a second end for mechanically and electrically linking with the second part of the first connector (233).

5. A head drum assembly according to any of the preceding claims, in which the first connector (233) is a tight mechanical fit within the through hole (230a).

Patentansprüche

1. Kopftrommelanordnung für einen Bandrekorder, enthaltend:

eine feststehende Trommel (230), die auf der Hauptbasis (10') eines Gehäuses angebracht ist und ein Durchgangsloch (230a) aufweist, das an ihrem Boden ausgebildet ist;
eine Drehtrommel (220), die einen Magnetkopf (h) hat und drehbar an der feststehenden Trommel (230) durch eine Drehwelle (210) angebracht ist; und
Rotationstransformatoren (221, 231), die in der Drehtrommel (220) und der feststehenden Trommel (230) angebracht sind, um ein Informationssignal, das vom Magnetkopf (h) gelesen wird, zu einer Hauptschaltkarte (PCB)(20') zu senden;
dadurch gekennzeichnet, dass
eine flexible gedruckte Schaltung (232) mit den Rotationstransformatoren (221, 231) auf einer ersten Seite des Durchgangsloches (230a) elektrisch verbunden ist; und
ein erster Verbinder (233) mit einem Ende der flexiblen gedruckten Schaltung (232) verbunden ist, um die flexible gedruckte Schaltung (232) mit der Haupt-PCB (20') elektrisch zu verbinden;
wobei die flexible gedruckte Schaltung (232) direkt nach unten durch das Durchgangsloch (230a) derart ausgeleitet ist, dass der erste Verbinder (233) elektrisch mit dem zweiten Verbinder (21') verbunden ist, der in der Haupt-PCB (20') installiert ist, die sich auf einer zweiten Seite des Durchgangsloches (230a) befindet.

2. Kopftrommelanordnung nach Anspruch 1, bei der der erste Verbinder (233) durch Einpassung mit dem Durchgangsloch (230a) gekoppelt ist.

3. Kopftrommelanordnung nach Anspruch 1, bei der:

der erste Verbinder (233) einen ersten Teil hat, der mechanisch mit der feststehenden Trommel (230) über das Durchgangsloch (230a) gekoppelt ist, und einen zweiten Teil für die elektrische Verbindung der flexiblen gedruckten Schaltung (232) mit der Haupt-PCB(20').

4. Kopftrommel nach Anspruch 3, bei der ein zweiter Verbinder (21) vorgesehen ist, der über ein erstes Ende verfügt, elektrisch und mechanisch mit der Haupt-PCB (20') verbunden ist und ein zweites Ende aufweist, um mit dem zweiten Teil des ersten Verbinders (233) verbunden zu werden.

5. Kopftrommel nach einem der vorhergehenden Ansprüche, bei der der erste Verbinder (233) mechanisch fest in das Durchgangsloch (230a) eingepasst ist.

Revendications

1. Ensemble de tambour porte-tête pour un enregistreur à bande comprenant :

un tambour fixe (230) fixé sur une base principale (10') d'une platine et ayant un trou de passage (230a) formé sur son fond ;
un tambour rotatif (220) ayant une tête magnétique (h) et installé de manière rotative sur le tambour fixe (230) par un arbre de rotation (210) ; et
des transformateurs rotatifs (221, 231) installés dans le tambour rotatif (220) et le tambour fixe (230), pour transmettre un signal d'information lu par la tête magnétique (h) à une carte de circuit imprimé principale (PCB) (20') ;
caractérisé par :

un circuit imprimé flexible (232) raccordé électriquement aux transformateurs rotatifs (221, 231) sur un premier côté du trou de passage (230a) ; et

un premier connecteur (233) couplé à une extrémité du circuit imprimé flexible (232) pour raccorder électriquement le circuit imprimé flexible (232) à la PCB principale (20') ;
dans lequel le circuit imprimé flexible (232) est retiré directement vers le bas via le trou de passage (230a) de sorte que le premier connecteur (233) est raccordé électriquement à un second connecteur (21') installé sur la PCB principale (20') qui est située sur un second côté du trou de passage (230a).

2. Ensemble de tambour porte-tête selon la revendication 1, dans lequel le premier connecteur (233) est couplé de manière ajustée au trou de passage (230a).

3. Ensemble de tambour porte-tête selon la revendication 1, dans lequel :

le premier connecteur (233) a une première partie couplée mécaniquement avec le tambour fixe (230) via ledit trou de passage (230a) et une seconde partie pour le raccordement électrique du circuit imprimé flexible (232) à la PCB principale (20').

4. Ensemble de tambour porte-tête selon la revendication 3, dans lequel un second connecteur (21) est prévu comportant une extrémité couplée de manière électrique et mécanique avec la PCB principale (20') et une seconde extrémité pour une liaison mécanique et électrique avec la seconde partie du premier connecteur (233).

5. Ensemble de tambour porte-tête selon l'une quelconque des revendications précédentes, dans lequel le premier connecteur (233) est monté à ajustement mécanique serré à l'intérieur du trou de passage (230a).

FIG. 1(PRIOR ART)

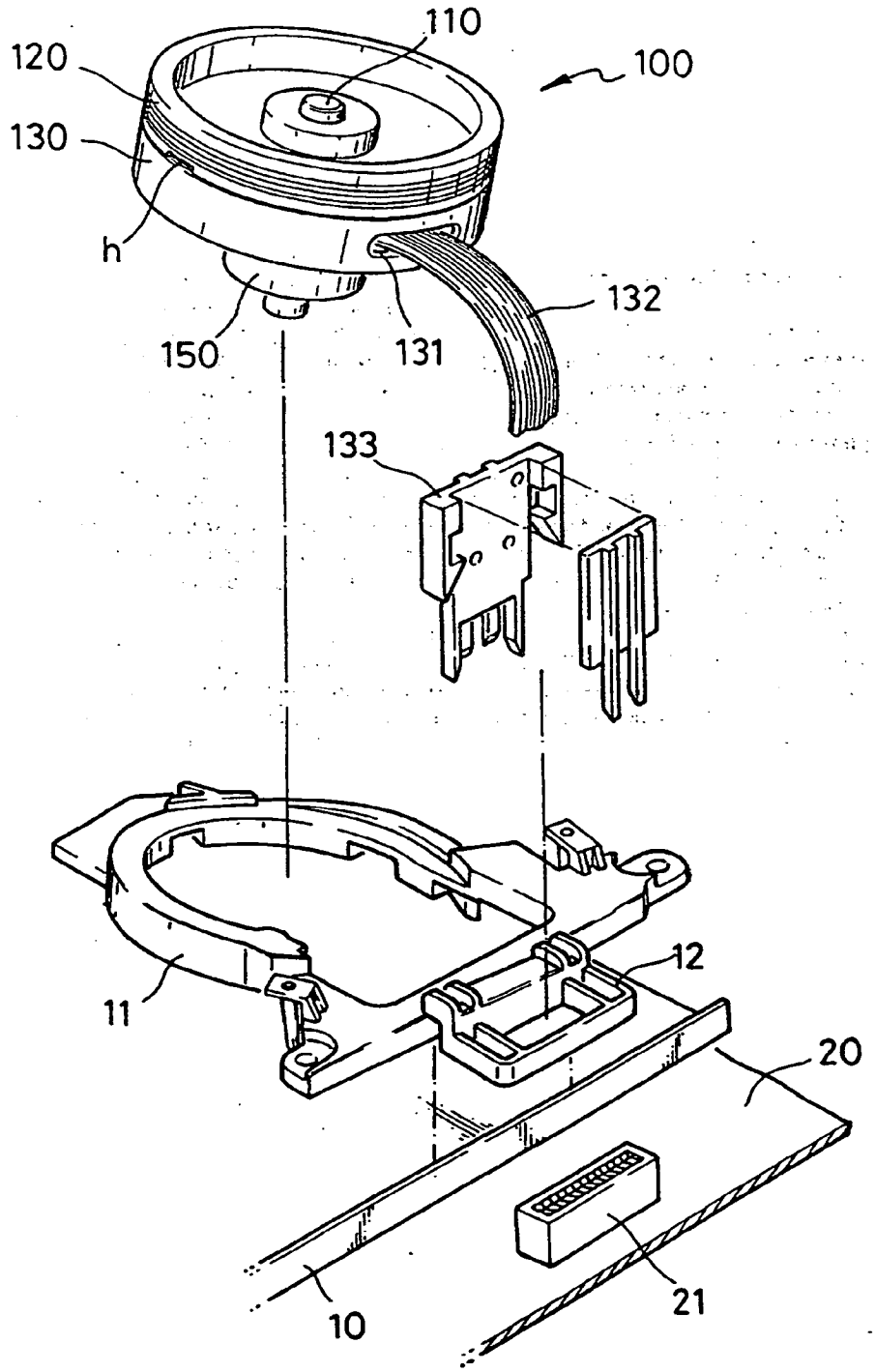

FIG.2(PRIOR ART)

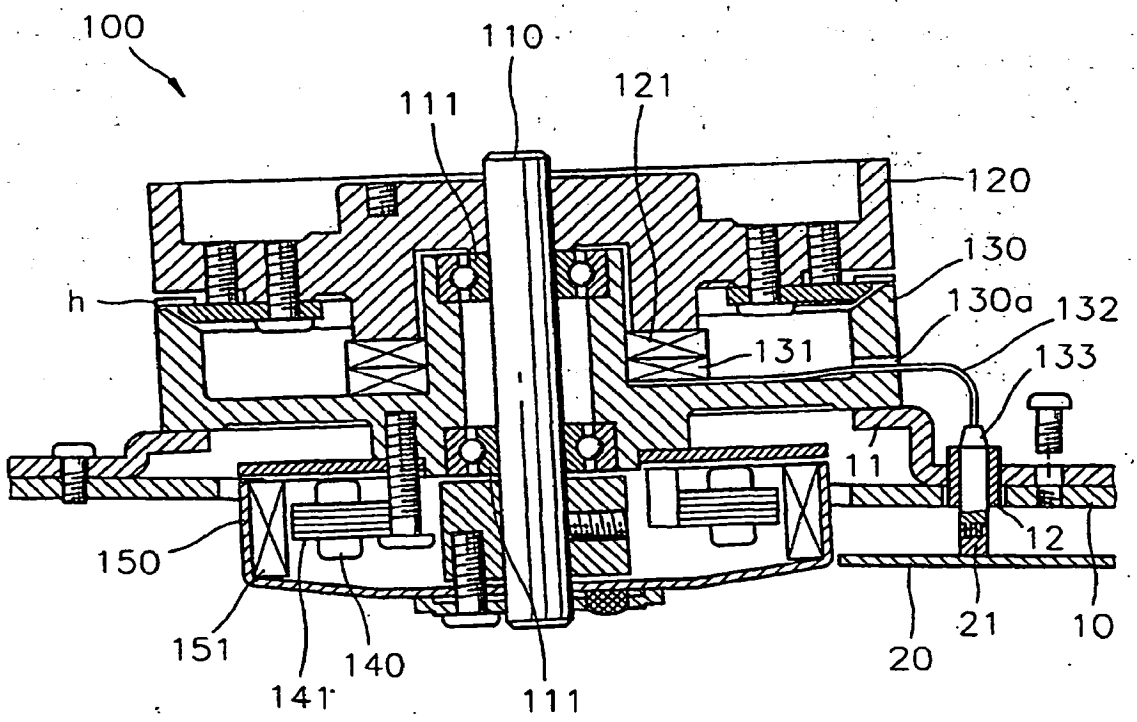

FIG.3

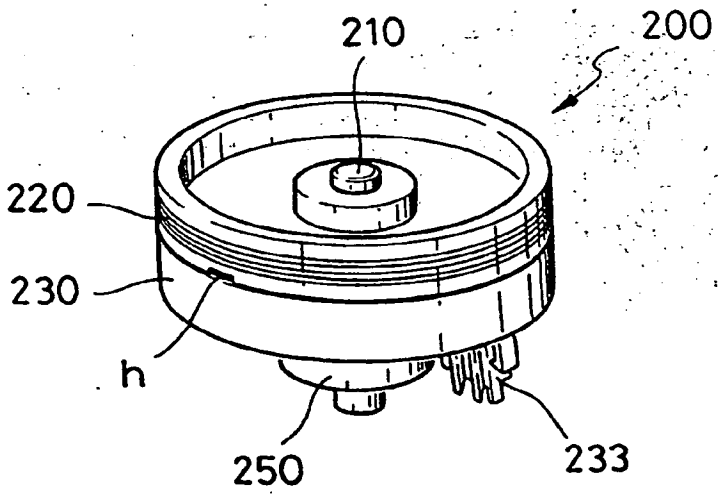

FIG.4